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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,677	08/25/2003	James J. Rawnick	7162-82	3291

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EXAMINER	
CAO, HUEDUNG X	
ART UNIT	**PAPER NUMBER**
2821	

DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/647,677	RAWNICK ET AL.	
	Examiner	Art Unit	
	Huedung X Cao	2821	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-8,10-15 and 18-20* is/are rejected.

7)☒ Claim(s) *2,9,16 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *09/27/04; 08/25/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The IDS filed on 08/25/2003 has been considered. Further, the applications disclosed therein have been fully considered, but were lined through because the Office does not print pending unpublished application information on US patents.

Specification

2. The abstract of the disclosure fails to comply with 37 CFR 1.72(b) which requires the abstract to be under the heading "Abstract of the Disclosure". In the instant case, the current abstract is under the heading "Abstract of the Invention". Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-8, 10-15, and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over MARTIN et al. (Patch Antenna Adjustable in Frequency Using Liquid Crystal, pages 699-702) in view of VAUGHAN, Jr. (USP 6,633,161).

As per claim 1, Martin teaches the claimed "method for varying an operating band of an antenna" (Martin, page 699, column 2, lines 5-6; the adjustable patch antenna), comprising the steps of:

magnetically and electrically coupling at least one antenna element to a fluid dielectric (Martin, page 700, column 2, figure 4; the liquid crystal acts as the fluid dielectric inside the antenna), and

varying property of said fluid dielectric coupled to said at least one antenna element to selectively maximize efficiency of said antenna element on a plurality of operating bands (Martin, page 701, column 1, lines 24-29; the change of dielectric constant in the liquid crystal causes the change in operating frequency).

It is noted that Martin does not teach that the varied property of the liquid dielectric is the "volume" of the liquid dielectric as claimed. However, Vaughan teaches that the change in "volume" of the fluid dielectric to control the operating frequency is well known in the art (Vaughan teaches that either dielectric constant or volume of the fluid dielectric can be used to control the operating frequency; column 10, lines 4-11). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by varying the "volume" of the fluid dielectric to control the operating frequency. The purpose of to control the operating frequency by varying "volume" of the fluid dielectric is the simplification of selection the resonate frequency to provide the signals of good quality.

Claim 3 adds into claim 1 "varying said volume to selectively cause said at least one antenna element to be resonant at said plurality of operating bands" which Martin does not teach. However, Vaughan teaches that the change in "volume" of the fluid dielectric to selectively cause said at least one antenna element to be resonant at said plurality of operating bands is well known in the art (Vaughan teaches that either dielectric constant or volume of the fluid dielectric can be used to control the operating frequency; column 10, lines 4-11). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by varying the "volume" of the fluid dielectric to selectively cause said at least one antenna element to be resonant at said plurality of operating bands. The purpose of to control the operating frequency by varying "volume" of the fluid dielectric is the simplification of selection the resonate frequency to provide the signals of good quality.

Claim 4 adds into claim 1 "the step of selecting said fluid dielectric to include magnetic particles" which Martin teaches in the LC molecules which change the orientation under the electromagnetic field of the DC circuit (Martin, page 699, column 2, lines 25-30; page 701, column 1, lines 1-5).

Claim 5 adds into claim 1 "varying at least one of a capacitive and a magnetic loading of said at least one antenna element" which Martin does not teach. However, Vaughan teaches that the change in "at least one of a capacitive and a magnetic loading of said at least one antenna element" is well known in the art (Vaughan teaches that the change in capacitive of the

capacitance elements 32; column 9, lines 18-22; column 10, lines 33-37). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by varying at least one of a capacitive and a magnetic loading of said at least one antenna element to selectively cause said at least one antenna element to be resonant at said plurality of operating bands. The purpose of varying at least one of a capacitive and a magnetic loading of said at least one antenna element is the simplification of matching the resonate frequencies in the selection the operating frequency to provide the signals of good quality.

Claim 6 adds into claim 1 "coupling said fluid dielectric to said at least one antenna element over a continuous area defined by said at least one antenna element" which Martin teaches in the base to engrave the patch antenna (Martin, page 700, Martin's liquid crystal is housed in the cavity area located between the patch and the ground plane; column 2, lines 1-2; figure 3) (see also Vaughan, the cavity walls, column 10, lines 12-25).

Claim 7 adds into claim 1 "selectively distributing said fluid dielectric to a plurality of separate cavity structures coupled to said at least one antenna element" which Martin does not teach. However, Vaughan teaches the selective distribution of the dielectric in cavity through the tube 30 and a suitable pump (Vaughan, column 10, lines 4-8). It would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by selectively distributing

the fluid dielectric to change the property of fluid dielectric. The purpose of selective distribution of the fluid dielectric is to adjust the shift of the antenna resonance frequency whenever required.

Claim 8 adds into claim 7 "the step of distributing said cavity structures about an area defined by said at least one antenna element" which Martin does not teach. However, Vaughan teaches the selective distribution of the dielectric within the semi-elastic cavity walls, which change the contact area under the pressure through the tube 30 and a suitable pump (Vaughan, column 10, lines 12-25). It would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by selectively distributing the fluid dielectric to change the property of fluid dielectric through the area of the semi-elastic walls. The purpose of selective distribution of the fluid dielectric through the contact area of the cavity walls is to adjust the shift of the antenna resonance frequency whenever required.

As per claim 10, Martin teaches the claimed "antenna" comprising "at least one antenna element' (Martin, page 699, column 2, lines 5-6; the adjustable patch antenna), "a fluid dielectric magnetically and electrically coupled to said antenna element" (Martin, page 700, column 2, figure 4; the liquid crystal acts as the fluid dielectric inside the antenna), and a fluid control system responsive to a control signal for selectively varying property of said fluid dielectric coupled to said antenna element, whereby operation of said antenna element is provided on a plurality of operating bands (Martin, page 701, column 1, lines 24-29; the

change of dielectric constant in the liquid crystal causes the change in operating frequency).

It is noted that Martin does not teach that the varied property of the liquid dielectric is the "volume" of the liquid dielectric as claimed. However, Vaughan teaches that the change in "volume" of the fluid dielectric to control the operating frequency is well known in the art (Vaughan teaches that either dielectric constant or volume of the fluid dielectric can be used to control the operating frequency; column 10, lines 4-11). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by varying the "volume" of the fluid dielectric to control the operating frequency. The purpose of to control the operating frequency by varying "volume" of the fluid dielectric is the simplification of selection the resonate frequency to provide the signals of good quality.

Claim 11 adds into claim 10 "said antenna element is disposed on a dielectric substrate" which Martin teaches in the patch antenna engraved in the top of the dielectric liquid crystal (page 700, column 2, lines 1-2, and figure 3).

Claim 12 adds into claim 11 "at least one cavity structure is defined in said dielectric substrate for constraining said fluid dielectric" which Martin teaches in the cavity which houses the dielectric liquid crystal (page 700, column 2, figure 4) (see also Vaughan, column 9, lines 65, the cavity 12).

Claim 13 adds into claim 12 "said at least one cavity structure is substantially continuous within an area defined by said at least one antenna

element" which Martin teaches in the base to engrave the patch antenna (Martin, page 700, Martin's liquid crystal is housed in the cavity area located between the patch and the ground plane; column 2, lines 1-2; figure 3) (see also Vaughan, the cavity walls, column 10, lines 12-25).

Claim 14 adds into claim 12 "a plurality of said cavity structures" which Martin does not teach. However, Vaughan teaches the selective distribution of the dielectric within the plurality of the cavity structure of semi-elastic cavity walls, which change the contact area under the pressure through the tube 30 and a suitable pump (Vaughan, column 10, lines 12-25). It would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by selectively distributing the fluid dielectric to change the property of fluid dielectric through the area of the semi-elastic walls. The purpose of selective distribution of the fluid dielectric through the contact area of the cavity walls is to adjust the shift of the antenna resonance frequency whenever required.

Claim 15 adds into claim 14 "said plurality of cavity structures are distributed about an area defined by said at least one antenna element" which Martin does not teach. However, Vaughan teaches the selective distribution of the dielectric in cavity through the tube 30 and a suitable pump (Vaughan, column 10, lines 4-8). It would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by selectively distributing the fluid dielectric to change the property of fluid dielectric. The purpose of selective distribution of

the fluid dielectric is to adjust the shift of the antenna resonance frequency whenever required.

Claim 18 adds into claim 10 "a controller and said controller selectively varies said volume to cause said at least one antenna element to be resonant at said plurality of operating bands" which Martin does not teach. However, Vaughan teaches that the change in "volume" of the fluid dielectric to control the operating frequency by a controller is well known in the art (Vaughan, column 9, lines 18-22, teaches that either dielectric constant or volume of the fluid dielectric can be used to control the operating frequency; column 10, lines 4-11). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by varying the "volume" of the fluid dielectric to control the operating frequency. The purpose of to control the operating frequency by varying "volume" of the fluid dielectric is the simplification of selection the resonate frequency to provide the signals of good quality.

Claim 19 adds into claim 10 "said fluid dielectric is comprised of magnetic particles" which Martin teaches in the LC molecules which change the orientation under the electromagnetic field of the DC circuit (Martin, page 699, column 2, lines 25-30; page 701, column 1, lines 1-5).

Claim 20 adds into claim 10 "a controller and said controller selectively varies at least one of a capacitive and a magnetic loading of said at least one antenna element" which Martin does not teach. However, Vaughan teaches that the change in "at least one of a capacitive and a magnetic loading of said at least

one antenna element" is well known in the art (Vaughan teaches that the change in capacitive of the capacitance elements 32; column 9, lines 18-22; column 10, lines 33-37). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made, in view of the teaching of Vaughan, to configure Martin's method as claimed by varying at least one of a capacitive and a magnetic loading of said at least one antenna element to selectively cause said at least one antenna element to be resonant at said plurality of operating bands. The purpose of varying at least one of a capacitive and a magnetic loading of said at least one antenna element is the simplification of matching the resonate frequencies in the selection the operating frequency to provide the signals of good quality.

Allowable Subject Matter

4. Claims 2, 9, and 16-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 2, and claim 17, Martin and Vaughan fail to teach, among other features, the step of controlling said volume to selectively provide an efficient impedance match with an antenna feed circuit of said a least one antenna element for each of said operating bands.

Regarding claim 9, and claim 16, Martin and Vaughan fail to teach, among other features, the step of distributing said cavity structures spaced from one another along a direction extending from said at least one antenna element to a ground plane of said antenna element".

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lungwitz (USP 6,781,562 B1) discloses a radio transmitter and receiver having electrically acting tuneable antenna.

Warner et al (USP 5,957,969) disclosed a tuneable microwave ablation catheter system.

Inquires

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Huedung Cao whose telephone number is (571) 272-1939.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong, can be reached on (571) 272-1834. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

8. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Huedung Cao
Patent Examiner